



W M Oi3a Integrated Modem
Main Electrical Parameter
and Functional
Specification

Users Manual

Contents / Sommaire

1	Introduction	3
1.1	Scope	3
2	Generality	3
2.1	Overview	3
2.2	Physical characteristics.....	3
2.3	integrated Modem Design	4
3	Interface Description	5
3.1	The main connector.....	5
3.2	PIN Description.....	8
3.2.1	Power Supply	8
3.2.2	Serial Link RS232.....	8
3.2.3	Remote SIM Interface	9
3.2.4	Audio.. ..	9
3.3	SIM Interface.....	11
3.4	RF Interface	11
4	Connectors.....	12
4.1	Interface Connector	12
4.2	RF Connector	12
5	Safety Precautions	13
5.1	Safety in explosive substance environments.....	13
5.2	Aircraft safety	73
5.3	Safety in medical equipment environments	13
5.4	Vehicle safety	13
5.5	Precautions in case of loss or theft	14
5.6	Precautions for antenna release.....	14
5.7	Conclusion.....	14
6.0	RF Exposure instructions.....	15
7.0	Instructions to OEM.....	16

1 Introduction

1.1 Scope

This document describes the interfaces, the technical specifications, the main electrical parameters and functional descriptions for the integrated modem called WMOi3. This product includes a WM2C-G900-G1900 EGSM/PCS dual band module (pls refer to the WM2C-G900/G1900 specifications).

2 Generality

2.1 Overview

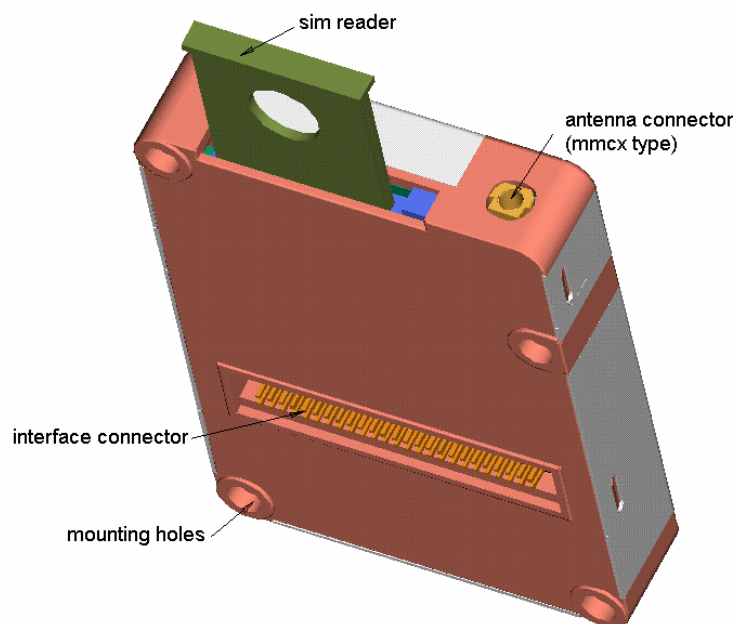
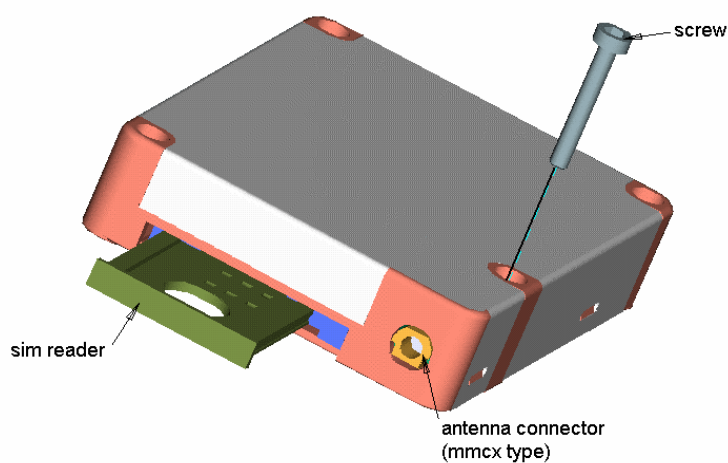
The integrated modem is a product with a sole connector which puts together all the interface signals in order to facilitate its integration. It has an integrated SIM connector as well as a standard RF connector type MMCX (Miniature Micro Connector).

2.2 Physical characteristics

The WMOi3 integrated modem has a complete self-contained shield. The physical characteristics are the following ones:

Physical characteristic	Qualification
Dimension Absolute maximum dimension	46 x64 x 12.4 mm
Weight	About 80 g
Volume	36.21 cm ³
Case	Zamack + stainless steel

2.3 Integrated Modem Design



3 Interface Description

3.1 The main connector

This is a 50 pins interface connector with a pitch of 1.27 from SAMTEC, referenced **FTS-125-01-L-DV**. (see figure1)

Figure 1 : 50 pins connector Bottom view

GND	2	1	GND
+5V	4	3	+5V
GND	6	5	CT109/DCD
SPK2N	8	7	GPIO2
SPK2P	10	9	CT125/RI
SPK1P	12	11	GPIO1
SPK1N	14	13	CT106/CTS
MIC2P	16	15	ON/~OFF
MIC2N	18	17	AUXV0
MIC1P	20	19	~RST
MIC1N	22	21	GND
GND	24	23	BOOT
GPIO0	26	25	CT103/TX
CT104/RX	28	27	CT107/DSR
CT105/RTS	30	29	CT108-2/DTR
COL4	32	31	COL3
COL2	34	33	COL1
COL0	36	35	ROW4
ROW3	38	37	ROW2
ROW1	40	39	ROW0
SPI_EN	42	41	GND
SPI_CLK	44	43	SPI_IO
SIMRST	46	45	SIMCLK
SIMPRES1	48	47	SIMVCC
GND	50	49	SIMDATA

The following table describes the electrical characteristics of the interface. Some signals require particular connections and are specified in bold characters.

<i>Pin #</i>	<i>Name</i>	<i>I/O</i>	<i>I/O type</i>	<i>Description</i>	<i>Comment</i>
1	GND			GROUND	High current
2	GND			GROUND	High current
3	+5V	I	Supply		High current
4	+5V	I	Supply		High current
5	CT109/DCD	O	CMOS/2X	RS232-Data Carrier Detect	
6	GND			GROUND	High current
7	GPIO2	I/O	CMOS/2X	General Purpose I/O	
8	SPK2N	O	Analog	Speaker2 negative output	
9	CT125/RI	O	CMOS/2X	RS232-Ring Indicator	
10	SPK2P	O	Analog	Speaker 2 positive output	
11	GPIO1	I/O	CMOS/2X	General Purpose I/O	
12	SPK1P	O	Analog	Speaker 1 positive output	
13	CT106/CTS	O	1X	RS232 interface Clear To Send	
14	SPK1N	O	Analog	Speaker 1 negative output	
15	ON/~OFF	I		Power ON/OFF control	
16	MIC2P	I	Analog	Microphone 2 positive input	
17	AUXV0	I	Analog	Auxiliary ADC input	
18	MIC2N	I	Analog	Microphone 2 negative input	
19	~RST	I		Reset active low	Open Collector
20	MIC1P	I	Analog	Microphone 1 positive input	
21	GND	I		Ground	
22	MIC1N	I	Analog	Microphone 1 negative input	
23	BOOT	I		BOOT	Open Collector
24	GND			GROUND	High current
25	CT103/TX	I		RS232 interface - Transmit	Pull up to VCC with 100KΩ when not used
26	GPIO0	I/O	CMOS/2X	General Purpose I/O	
27	CT107/DSR	O	1X	RS232 interface Data Set Ready	
28	CT104/RX	O	1X	RS232 interface – Receive	

29	CT108-2/DTR	I		RS232 interface Data Terminal Ready	Pull up to VCC with 100K Ω when not used
30	CT105/RTS	I		RS232 interface Request To Send	Pull up to VCC with 100K Ω when not used
31	COL3	I/O	1X	Keyboard column	
32	COL4	I/O	1X	Keyboard column	
33	COL1	I/O	1X	Keyboard column	
34	COL2	I/O	1X	Keyboard column	
35	ROW4	I/O	1X	Keyboard row	
36	COL0	I/O	1X	Keyboard column	
37	ROW2	I/O	1X	Keyboard row	
38	ROW3	I/O	1X	Keyboard row	
39	ROW0	I/O	1X	Keyboard row	
40	ROW1	I/O	1X	Keyboard row	
41	GND			GROUND	High current
42	SPI_EN	O	1X	SPI enable	
43	SPI_IO	I/O	1X	I ² C Data or SPI Data	
44	SPI_CLK	O	1X	I ² C Clock or SPI Clock	
45	SIMCLK	O	2X	Clock for SIM Interface	3V mode
46	SIMRST	O	2X	Reset for SIM interface	3V mode
47	SIMVCC	O		SIM card supply	3V mode 6mA max
48	SIMPRES1	I		SIM card detect	Connected to SIM connector pin 8. Pin 4 of SIM connector must be pulled down to GND with 1 K Ω
49	SIMDATA	I/O	3X	I/O for SIM interface	3V mode
50	GND			GROUND	High current

Nota : VCC could be either 3V or 5V.

All digital I/O are CMOS 3V compatible.

Operating conditions

Parameter	I/O type	Min	Max	Condition
V _{IL}	CMOS	-0.5V	0.8V	
V _{IH}	CMOS	2.1V	3.0V	
V _{OL}	1X		0.2V	I _{OL} = -1 mA
	2X		0.2V	I _{OL} = -2 mA
	3X		0.2V	I _{OL} = -3 mA
V _{OH}	1X	2.6V		I _{OH} = 1 mA
	2X	2.6V		I _{OH} = 2 mA

	3X	2.6V		$I_{OH} = 3 \text{ mA}$
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3.2 PIN Description

3.2.1 Power Supply

The main power supply will be provided through a double connection. These connections are respectively the pin 3 and 4 for the +5V and the pins 1 and 2 for the ground (GND).
The power supply is 5V +/-5% 1A.

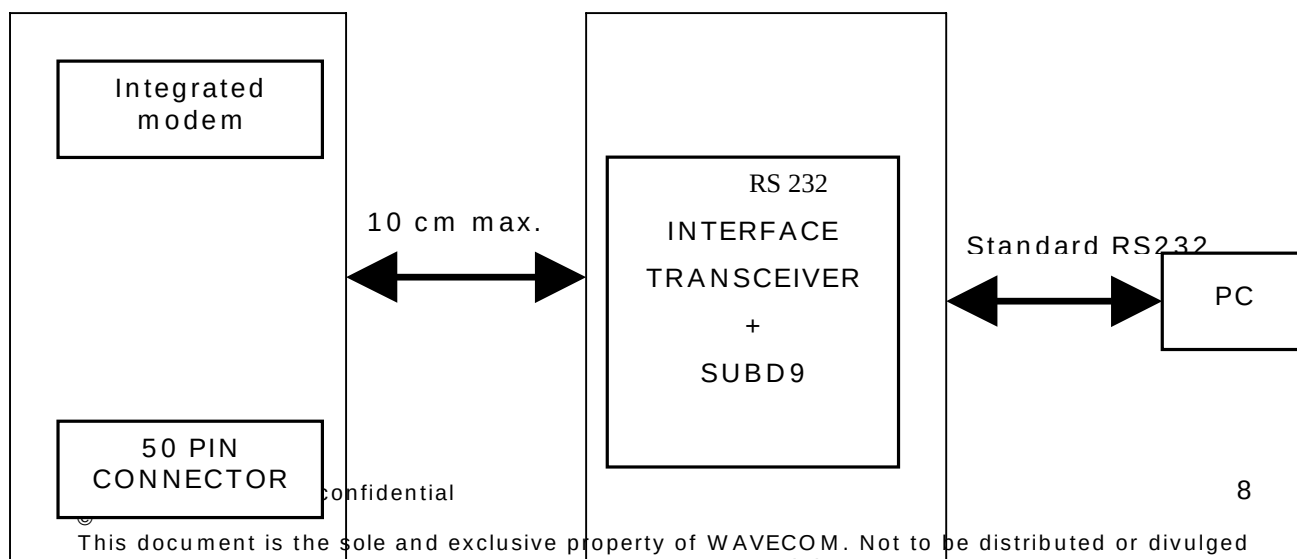
3.2.2 Serial Link RS232

This interface is needed for communication with a remote terminal with respect to the RS232 V.28 standard levels. As the integrated modem does not include a transceiver MAX3238 or MAX3237, this one has to be added outside with a SUBD9. The connection between the WMOi3 and the transceiver must not exceed 10 cm. The table below lists the needed signals for this interface :

PIN number	Signal	Description
5	DCD	Data Carrier Detect
28	RX	Reception
25	TX	Transmission
29	DTR	Data Terminal Ready
27	DSR	Data Set Ready
30	RTS	Request To Send
13	CTS	Clear To Send
9	RING	Ring indicator
2	GND	Ground

When the RS232 V.28 level is not needed, the above signals can be used as TTL 3V CMOS compatible signals.

Application example needing V.28 levels :



3.2.3 Remote SIM Interface

A SIM connector is already integrated on the integrated modem (see 3.3 SIM interface). However there is the possibility to implement a remote SIM connector using the signals described in the table below.

PIN number	Signal
47	SIMVCC
46	SIMRST
45	SIMCLK
50	GND
49	SIMDATA
48	SIMPRES

3.2.4 Audio

The modem allows the connection of a handset or a headset through AUDIO signals

The audio end stage must respects the following specifications :

3.2.4.1 Microphone 2

The MIC2 inputs are differential ones. They already include the convenient biasing for an electret microphone (0,5 mA and 2 Volts). This electret microphone can be directly connected on these inputs. The impedance of the microphone 2 has to be around 2k Ω . These inputs are the standard ones for an handset design while MIC1 inputs can be connected to an external headset or a handsfree kit.

The gain of MIC2 inputs is internally adjusted. The gain can be tuned from 30dB to 51dB. The connexion to the microphone is direct.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC2P	16	I	Analog	Microphone 2 positive input
MIC2N	18	I	Analog	Microphone 2 negative input

3.2.4.2 Microphone 1

The MIC1 inputs are differential and do not include internal bias. To use these inputs with an electret microphone, bias has to be generated outside the WMOi3 modem according to the characteristic of this electret microphone. These inputs are the standard ones used for an external headset or a handsfree kit. The connection can be either differential or single-ended but using a differential connection in order to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

The gain of MIC1 inputs is internally adjusted. The gain can be tuned from 30dB to 51dB.

Pin description

Signal	Pin #	I/O	I/O type	Description
MIC1P	20	I	Analog	Microphone 1 positive input
MIC1N	22	I	Analog	Microphone 1 negative input

3.2.4.3 Speaker 2

Speaker outputs SPK2 are push-pull amplifiers and can be loaded down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be directly connected to a speaker. The connection can be differential or single-ended but using a differential connection to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as shielding in order to avoid any disturbance on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
SPK2P	10	O	Analog	Speaker 2 positive output
SPK2N	8	O	Analog	Speaker 2 negative output

3.2.4.4 Speaker 1

Speaker outputs SPK1 are push-pull amplifiers and can be loaded down to 50 Ohms and up to 1nF. These outputs are differential and the output power can be adjusted by step of 2dB. The output can be directly connected to a speaker. The connection can be differential or single-ended but using a differential connection to reject common mode noise and TDMA noise is recommended. When using a single-ended connection, be sure to have a very good ground plane, a very good filtering as well as a shielding in order to avoid any disturbance on the audio path.

Pin description

Signal	Pin #	I/O	I/O type	Description
SPK1P	12	O	Analog	Speaker 1 positive output
SPK1N	14	O	Analog	Speaker 1 negative output

3.3 SIM Interface

The provided SIM connector has been designed **for 3V technology SIMs only**. The remote Sim connector must be placed at 10cm max. from the WMOi3.

3.4 RF Interface

The RF connector is MMCX (Miniature Micro Connector) standard type for a surface mounting. This device should not be used in fixed applications. An antenna can be directly connected through the matting connector or using a small MMCX / SMA adapter. Maximum gain of the attached antenna is 3 dBi for mobile devices. The antenna must comply with the following specifications:

	EGSM	PCS
Frequency RX	925 to 960 MHz	1930 to 1990 MHz
Frequency TX	880 to 915 MHz	1850 to 1910 MHz
Impedance	50	

4 Connectors

4.1 Interface Connector

The main connector is a 50 pins interface connector from SAMTEC.

Reference	Type	Remarks
CLP-125-02-L-D	Low Profile	Standard connector used on starter kit board
FLE-125-02-S-D	High Profile	To be used if you place components below the modem
FFSD-25-04.00-01-N	Flat cable	TBD

4.2 RF Connector

The standard RF connector is a M MCX type (Miniature Micro Connector) from Amphenol, IMS,

Amphenol Reference	Type	Coax cable reference
908-41300	Straight plug	RG-174, 188, 316
908-41200	Straight plug	RG-178, 196
908-43300	Right Angle plug	RG-174, 188, 316
908-43200	Right Angle plug	RG-178, 196

5 Safety Precautions

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

5.1 Safety in explosive substance environments

- WMOI3 is not recommended to be used in a gas station.
- In fuel depots, chemical plants and locations where explosives are ignited, users are reminded to comply with restrictions regarding the use of radio devices.

5.2 Aircraft safety

The use of WMOI3 on board aircraft is forbidden by law. Consequently, Switch **OFF** your modem when in an aircraft, disrupt the cellular network is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.

5.3 Safety in medical equipment environments

Switch **OFF** your WMOI3 when in hospital. There may be a hazard associated with the operation of your modem close to inadequately protected personal medical devices such as hearing aids and pacemakers. Please address all questions to the medical devices manufacturer to determine if it is adequately protected.

5.4 Vehicle safety

- Do not use your WMOI3 modem while driving, unless equipped with a correctly installed vehicle hands-free kit.
- Comply with national regulations on the use of cellular telephones in vehicles.
- If incorrectly installed in a vehicle, the WMOI3 modem could interfere with the correct functioning of vehicle electronics. To avoid such problems, ensure that the installation has been performed by a skilled personnel.
- Safety on the road requires that it is not permitted to signal incoming calls by sounding the vehicle's horn or flashing the lights.

5.5 Precautions in case of loss or theft

In case of missing your WMOi3 and/or your SIM card, please notify your network operator immediately in order to avoid misuse.

5.6 Precautions for antenna release

It is important to make sure that the antenna stands in an open space for a proper functioning of the WMOi3 wireless modem.

5.7 Conclusion

Your WMOi3 modem is the product of advanced engineering, design and craftsmanship carried out by Wavecom and it should be treated with care.

6. RF exposure instructions

Pursuant to 47 CFR § 24.52 of the FCC Rules and Regulations, personal communications services (PCS) equipment is subject to the radiofrequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and 5 2.1093, as appropriate.

The Wavecom Modem is a GSM (PCS-1900) terminal which operates in the US licensed PCS frequency spectrum. The device transmits over the 1850-1910 MHz band and receives over the 1930-1990 MHz band.

Wavecom, Inc. certifies that it has determined that the Modem complies with the RF hazard requirements applicable to broadband PCS equipment operating under the authority of 47 CFR Part 24, Subpart E of the FCC Rules and Regulations. This determination is dependent upon installation, operation and use of the equipment in accordance with all instructions provided.

The Modem is designed for and intended to be used in mobile, not fixed applications. "Fixed" means that the device is physically secured at one location and is not able to be easily moved to another location. "Mobile" means that the device is designed to be used in other than fixed locations and generally in such a way that a separation distance of at least 20 cm (8 inches) is normally maintained between the transmitters antenna and the body of the user or nearby persons. The Modem is not designed for or intended to be used in portable applications (within 20 cm of the body of the user) and such uses are strictly prohibited.

To ensure that the unit complies with current FCC regulations limiting both maximum RF output power and human exposure to radiofrequency radiation, a separation distance of at least 20 cm must be maintained between the units antenna and the body of the user and any nearby persons at all times and in all applications and uses. Additionally, in mobile applications, maximum antenna gain must not exceed 3 dBi (to comply with Section 24.232(b)) and is limited to 7dBi for fixed applications. Finally, the tune-up procedure for the O9EWM013A ensures that the maximum RF output power of the device does not exceed 30.0dBm within the variations that can be expected due to quantity production and testing on a statistical basis.

7. Instructions to OEM

Wavecom User's manual includes specific warnings and cautions in order to ensure that OEMs are aware of their responsibilities, with regard to RF exposure compliance, for products into which the Modem is integrated. With this guidance, the OEM will be able to incorporate into their documentation the necessary operating conditions and warnings.

OEMs need to provide a manual with the "final" product that clearly states the operating requirements and conditions and that these must be observed to ensure compliance with current FCC RF exposure requirements / MPE limits (refer to chapter 6. RF exposure instructions). This will enable the OEM to generate (and provide the end-user with) the appropriate operating instructions, warnings and cautions, and/or markings for their product.

